

The crest of this rise passed Cairo, Ill., during the 22d to the 24th, but danger-line stages were not reached, except at Evansville, Ind., where the maximum stage was 36.1 feet on the 21st, 1.1 feet above the danger line. The necessary warnings were issued on the 18th, and the actual damage was limited to the overflowing of some lowlands that had been planted in corn. Farming operations, however, were greatly delayed, owing to the wet soil.

The Tennessee River fell during the first week of the month, immediately after which heavy rains set in, resulting in a general rise. Stages of from 2 to 3 feet above the danger lines were experienced from Florence, Ala., to the mouth of the river. Above Florence the rise, while very marked, was not at all dangerous. General warnings which were issued on the 8th proved to be of great value. Near Riverton, Ala., 40,000 railroad ties were saved, while at Chattanooga, Tenn., tannery supplies to the value of \$40,000 were moved to a place of safety, upon the advice of the forecast official.

The western tributaries of the Mississippi River, except the Missouri, fell steadily throughout the month. Those in the

State of Louisiana, except the Atchafalaya, going below the danger lines for the first time in several weeks.

The condition of the rivers of New England and the Middle Atlantic States was very satisfactory, nothing of special interest was noted. There was a gradual fall throughout the month.

In the South Atlantic and east Gulf States the rivers were high during the early days of the month as a result of the heavy rains of the closing days of March. The necessary warnings had been issued and no harm was done, except that occasioned by the enforced delay in lumbering and lowland farming operations.

The highest and lowest water, mean stage, and monthly range at 175 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

## CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions during April are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

**Alabama.**—Quite cool, unfavorable for germination and growth. Temperatures as low as 30° in northern and north-central counties on 4th and 5th, slightly damaging frosts as late as 24th. Destructive local windstorms, hail, and excessive rains; generally deficient rainfall, favorable for work, except on lowlands, which crusted badly. Bulk of cotton and upland corn planted, but stands seriously injured by cold; minor crops did fairly well, fruit unpromising.—*F. P. Chaffee.*

**Arkansas.**—First decade was favorable for all farm work, and considerable progress was made in planting. During second decade cool, wet weather interfered with planting and prevented proper germination of seed. During third decade cool and dry, cotton planting was nearing completion, except in southern tier of counties, and early planted was coming up to a medium stand, poor color. Some corn was up, stand poor; considerable replanting of cotton and corn was necessary. Wheat and oats made slow progress. Considerable damage by frost on the 30th.—*Edward B. Richards.*

**Arizona.**—Cool weather prevailed during the greater portion of April, but there was some quite warm weather during the third decade. The greater part of the month was dry, and over a large area no rain whatever fell. There was considerable rain in the northern and central portions of the territory early in the month and about the middle of the month. The condition of crops was somewhat backward on account of cold weather, but the prospects at the end of the month were generally the best in years, due to rains earlier in the season and to the ample supply of irrigation water. This latter, however, was diminishing.—*M. E. Blystone.*

**California.**—The temperature was considerably below normal, and the rainfall less than average. Heavy frosts on the 10th and 11th caused slight injury to early deciduous fruits, but grapes and citrus fruits were not injured. The heavy rainfall in southern California caused very little damage to grain and new hay, and greatly benefited all crops. Grain and grass in the central and northern sections were beginning to suffer from scanty rainfall toward the close of the month.—*G. H. Willson.*

**Colorado.**—Temperature averaged nearly normal; the nights were so cool that germination and growth were slow; sharp frosts were frequent, culminating east of the mountains in a severe freeze at the close of the month, when gardens, early beets, alfalfa, and fruit suffered badly. Plowing and seeding made favorable progress and good stands of small grain were general. With the warm weather of the third decade, many varieties of fruit began to bloom in eastern and southern counties, and much damage resulted from the freezing weather that prevailed at its close. The snow remained unusually late in the mountains; considerable melting occurred on southern slopes and in unprotected places, but on the whole the amount of moisture stored in the form of snow or in the ground was greater than at the close of March. The ground was comparatively dry, and the run off had been small at the close of the month.—*F. H. Brandenburg.*

**Florida.**—The month was abnormally dry and cool. The general conditions were favorable for farm work, which was well advanced. The

drought retarded germination, and low temperatures had an ill effect on cotton and corn. Cotton chopping was pushed and early corn worked several times; much replanting of both staples was necessary. Citrus trees suffered for want of rain, there being numerous reports of fruit dropping. Pineapples did very well. Oats suffered very much. The crop promises to be light.—*A. J. Mitchell.*

**Georgia.**—Frosts were quite general on the 5th, 23d, and 24th. The rainfall was slightly above normal in the middle section and deficient elsewhere. The weather was not favorable for crops. Cotton planting was very late and germination and growth were slow; cool weather during the latter portion of the month caused many young plants to die and stands were generally poor. Wheat and oats were attacked by rust and the hessian fly and deteriorated steadily. A short peach crop is anticipated. The season is very backward throughout the entire State.—*J. B. Marbury.*

**Idaho.**—Severe frost occurred on the 29th; most of the fruit was thought to be uninjured. Precipitation averaged nearly normal and was well distributed throughout the month, occurring at some stations on every day except the 13th. Vegetation backward, but otherwise in good condition.—*S. M. Blandford.*

**Illinois.**—During the first decade the temperature was above the seasonal average, the soil had dried out, and plowing was being actively prosecuted. Wheat was in a promising condition; considerable progress had been made in the seeding of oats and meadows and pastures were making vigorous growth. Conditions during the latter part of the month were generally unfavorable. Rains made the soil heavy and plowing was retarded; unseasonably cold weather arrested the growth of wheat and affected the germination of oats.—*William G. Burns.*

**Indiana.**—At beginning of April wheat, rye, clover, timothy, and pastures were showing growth in advance of season and some oats had been sown; but excessive moisture in ground and low temperature with frequent frosts during the month delayed farm work and retarded growth of vegetation, so that at its close oats had not all been sown, but little plowing for corn had been done, the grasses and fall sown cereals were in only average condition, and fruit had been greatly injured.—*W. T. Blythe.*

**Iowa.**—Conditions were favorable for an early start of grasses and winter grains; but at the outset the soil was saturated and was kept excessively moist by seasonal rains and the prevalence of cloudy and misty weather. This retarded seeding and plowing for corn to an unusual extent, and the usual acreage of oats and spring wheat was somewhat reduced by excessive moisture in fields intended for these crops.—*John R. Sage.*

**Kansas.**—Wheat in good condition, growing well, and the third week began jointing in several counties; but little damage from hessian fly. Oat sowing finished. Much corn planted. Frost cut off early apples and injured all fruit.—*T. B. Jennings.*

**Kentucky.**—The temperature averaged considerably above the normal during the first twelve days of April and all vegetation got an excellent start. The remainder of the month was cool. Light frost occurred in many localities on the 18th, 22d, and 23d, but no serious damage resulted. Cool nights retarded the growth of vegetation to quite an extent during the latter part of the month. Farm work was delayed by frequent rains, and at the close of the month was quite backward.—*H. B. Hersey.*

**Louisiana.**—The weather during the month was not favorable for agricultural interests. Preparations for cotton planting and planting were pushed vigorously during the early part of the month, but by the close of the second decade a general drought was interfering materially with farm work. The cotton crop is from two to three weeks late. As a

result of the drought and cold weather, and frost on the night of April 30, much replanting will be necessary. Sugar cane made satisfactory growth during the first decade, but dry, cool weather during the remainder of the month retarded its growth; through the conservation of moisture by tillage, however, the crop held its own. Rice seeding progressed. Truck gardens were backward.—*I. M. Cline.*

**Maryland and Delaware.**—The severe frosts of the 5th and 6th injured tender growth, and seriously reduced the prospective yields of all fruits, except apples. The long wet spell early in the month hurt wheat, especially in the lowlands. All farming operations were delayed until the final ten days, and the acreage of oats was considerably reduced. Very little ground was prepared for corn. Grasses grew fairly well. Tobacco plants were plentiful and healthy. All truck operations were quite backward.—*Oliver L. Fassig.*

**Michigan.**—There was too much precipitation during the early part of the month in the central and southern counties to permit of much fieldwork. The latter part of the month was drier and more favorable for fieldwork, but the cool, frosty weather during the last decade retarded growth and germination. At the close of the month plowing was general in all counties of the lower peninsula and had been begun in most counties of the upper. Oat, pea, and barley seeding were well advanced in the lower peninsula, and in the upper peninsula farmers were beginning to sow oats, peas, and spring wheat. Just as the month closed sugar beet seeding was quite generally begun in the principal sugar beet counties, and early potato planting was in progress in most of the central and southern counties.—*C. F. Schneider.*

**Minnesota.**—The soil was wet and frequently frozen until about the 12th; after that there were occasional rains, which, in the Red River Valley, were hardly heavy enough to delay seeding. On the 24th there was light snow in a few southeastern counties. Seeding in the Red River Valley was almost continuous after the 15th, and at the close of the month wheat seeding was everywhere well advanced. Oat and barley seeding was progressing well, and some potatoes and flax had been put in. Germination was slow late in the month because of cold weather.—*T. S. Outram.*

**Mississippi.**—Planting was about completed, except in the overflowed districts, but the cool and unprecedentedly dry weather was very unfavorable for germination and growth. Corn came up slowly and stands were generally poor; some replanting was done. Very little cotton came up. Oats deteriorated rapidly. Vegetable crops were backward, except potatoes, which did fairly well. Strawberries made a fair yield. The outlook for tree fruits was good south, but poor north.—*W. S. Belden.*

**Missouri.**—The weather was generally unfavorable for farming operations; the soil remained heavy and cold, delaying plowing and planting, and the low temperatures of the middle and latter parts of the month retarded the germination of seeds and the growth of vegetation. At the close of the month corn planting was well advanced in the southern sections, but in the central and northern counties but little planting had been done. The month closed with a killing frost, which was very destructive to fruit of all kinds.—*A. E. Hackett.*

**Montana.**—A cold, backward spring greatly retarded farm work. In the south-central counties, in sections of Meagher and Fergus counties, and in the valleys on the west side of the main range moist snows were frequent, but in other parts of the State more moisture is needed. Ranges have not made satisfactory progress. At end of month farm work was under way, but was being prosecuted with difficulty on account of dry, cold weather. The freezes and frosts damaged some early vegetables, but did not seriously affect winter wheat.—*Montrose W. Hayes.*

**Nebraska.**—Oats and spring wheat were sown under favorable conditions during the first two decades and generally came up well. Plowing and all farm work progressed well; but very little corn was planted because of the low temperature during the last of the month. Winter wheat continued in fine condition. The severe storm of the 28th and 29th, accompanied by temperatures ten or more degrees below freezing, was hard on all vegetation. Most of the early fruit was in bloom and was ruined, while late fruit was seriously damaged. Oats were injured somewhat, but probably will entirely recover. Wheat was not injured.—*G. A. Loveland.*

**Nevada.**—The month was slightly deficient in both temperature and precipitation. Weather favorable for plowing and seeding; the low night temperatures were unfavorable for the germination of seeds and the growth of vegetation. Early sown grain up and looking well at the close of the month. Fruit trees backward in blooming. Prospects for a water supply the best in many years.—*J. H. Smith.*

**New England.**—The weather of the month was pleasant and generally favorable for outdoor work and for farming operations; gardens were planted and much seeding done. It was, however, too cool, and in some sections too dry for vegetable growth. Fruit trees bloomed full, and excepting peaches, the conditions at the close of the month were favorable for a good crop. An increased acreage of tobacco was reported. Pasture was good in many sections and stock was turned out.—*J. W. Smith.*

**New Jersey.**—The first half of the month was characterized by killing frosts on the 2d, 4th, 5th, and 6th, doing great injury to early orchard and small fruits then in bloom in the central and southern sections, and by frequent heavy rains, which retarded plowing and seeding; last half more favorable, during which time farm work advanced rapidly. The

month closed with abnormally high temperature, 90° being recorded at many stations.—*Edward W. McGinn.*

**New Mexico.**—A cold and backward month and vegetation very much retarded. Frost on morning of 30th killed over 50 per cent of the fruit in northeast portion of the Territory; in the central portion nearly all early fruits, such as peaches, apricots, cherries, and apples, were killed; in other parts prospects are very good. Grass on the ranges backward, and stock made slight improvement. Lambing season has been very satisfactory.—*R. M. Hardinge.*

**New York.**—While there were abnormally high and very low temperatures, and only light scattered showers after the 16th, the month of April as a whole was about normal as to temperature and precipitation. Owing to low temperatures and dry conditions wheat, rye, and grass declined, but fruit was considered to be safe up to the close of month, when seeding oats was in progress, some potatoes had been planted, and farmers were preparing corn land.—*R. G. Allen.*

**North Carolina.**—Conditions were decidedly unfavorable for growth of crops and for farm work during April. While the rainfall was only moderately above normal, it occurred in frequent showers, which kept the soil continuously unfit to be plowed, while the prevailing low temperatures prevented the proper germination of seeds. A severe freeze with killing frosts occurred throughout the State on the 5th, and other killing frosts in the west on the 18th and 24th, which seriously injured the fruit crop, though at a later date prospects for apples seemed favorable. Some planting was accomplished, chiefly corn on uplands; transplanting tobacco began, with plants fine and abundant. Winter wheat and oats deteriorated considerably. Truck crops and strawberries did fairly well.—*C. F. von Hermann.*

**North Dakota.**—The entire month was, as a rule, very favorable for farm work, except on lowlands, and in some few localities where there was too much rain. Wheat seeding became general about the middle of the month and progressed with but slight interruption until near the close, when killing frost and severe freezing weather caused either an entire suspension of or retarded work, especially on low, moist land. Vegetation was not sufficiently advanced to be damaged by the frosts.—*B. H. Bronson.*

**Ohio.**—Wheat improved, except in some poorly drained fields, and the general outlook for this crop was very promising. Plowing for corn delayed, and only a little done in the south. Oats did not germinate well, some reseeded was necessary. Pastures and grass advanced very slowly; the frosts of the last half of the month injured early clover, early cherries, plums, and strawberries in the south; apples and late fruit not damaged much.—*J. Warren Smith.*

**Oklahoma and Indian Territories.**—During the greater part of the month deficient and poorly distributed moisture made the surface soil almost impossible to work; the month was marked by short, but decidedly cool periods; that commencing with the 29th was accompanied by freezing temperatures and ice formation that cut early corn and cotton to the ground, and caused considerable damage to potatoes, grapes, berries, peaches, and pears, but potatoes and corn will probably revive; prospects were good for a fair crop of the larger fruit. Some corn was being cultivated. Cotton planting was in slow progress. Wheat suffered from lack of moisture, but recent rains brought it up to a good stand and the crop was making a good growth. Oats were in a poor condition. Alfalfa, rye, and grass made fair growth. Stock was in good condition.—*C. M. Strong.*

**Oregon.**—The month was somewhat cooler than usual. Precipitation was below the average, but sufficient fell to start grass and forage plants and render the soil in good condition for plowing and seeding. Vegetation in general made slow growth, owing to the cool nights. Frosts were frequent, and early fruits, especially peaches, were injured. The wheat crop, although backward, was thrifty and promising. Hops made excellent progress and work in the yards was actively pushed. Some corn and potatoes were planted. The wool clip and the increase in lambs were both below the average.—*Edward A. Beals.*

**Pennsylvania.**—The temperature and precipitation were practically normal, and the latter was exceptionally well distributed as regards area, but nearly all of it fell during the first half of the month. The month opened with conditions highly favorable to crops, which, as a whole, were from two to three weeks in advance of a normal season. The excess of moisture retarded farm work of all kinds and delayed seeding and planting during the first twenty days. The cool weather of the closing decade was unfavorable to germination and to the advancement of vegetation in general.—*T. F. Townsend.*

**Porto Rico.**—Cutting and grinding of cane favored by the weather. Grade of juice good, but cane did not yield normal amount. Young canes are doing well, but need rain. Tobacco harvest about completed, quality good, especially where raised under canvass. Coffee trees have blossomed abundantly and berries are developing rapidly. In some sections orange trees are being injured and killed by the June bug and white grub. Great interest has developed in the cultivation of Sea Island cotton. Stock has suffered for lack of water and pasture.—*E. C. Thompson.*

**South Carolina.**—Few frosts occurred and none were damaging. The temperature averaged too low for favorable germination or for rapid growth. Drought along the coast was detrimental to truck crops, but over the greater portion the rainfall was ample. Grain aphids continued

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings:

*Summary of Temperature and Precipitation by Sections, April, 1903.*

Section.	Temperature—in degrees Fahrenheit.								Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.						Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	61.0	-2.4	Dothan	89	23	4 stations	30	4.5	2.72	-1.59	Oneonta	5.54	Daphne	T.
Arizona	60.7	-1.5	Aztec	103	23	Ashfork	14	13	0.22	-0.05	Flagstaff	3.85	15 stations	0.00
Arkansas	60.5	-1.3	Pine Bluff	91	9	Pond	26	26	1.82	-2.20	Corning	4.92	Fort Smith	0.36
California	54.8	-2.7	Salton	108	29	Bodie	2	3, 11	1.28	-0.55	Cuyamaca	8.21	10 stations	0.00
Colorado	44.4	-0.8	Blaine	89	23	Ashcroft	7	13	1.62	-0.23	Ruby	10.45	Holyoke	0.35
Florida	67.1	-1.8	Orange City	90	12	Quincy	34	14	0.45	-2.08	Pinemont	1.53	6 stations	0.00
Georgia	60.7	-2.6	Ocala	90	30	Talbotton	25	5	3.06	-0.31	Talbotton	6.80	Bainbridge	0.47
Idaho	42.5	-1.7	Millen	92	11	Clayton	35	4	1.31	-0.04	Grangeville	3.17	Cambridge	0.47
Illinois	52.8	+0.3	Blue Lakes	86	25	Lake	4	12	1.31	-0.04	Robinson	8.01	Cairo	1.85
Indiana	51.8	-0.5	Aledo, New Burnside	88	9	Rantoul	16	4	4.32	+1.20	Edwardsville	7.36	Franklin	2.66
Iowa	49.8	+0.3	Madison, Salem	84	29	Laporte	10	5	4.42	-0.03	Grand Meadow	6.00	Logan	0.74
Kansas	55.2	-0.3	Mount Vernon	86	11	Larchmont	17	30	2.98	+0.23	Lakin	5.51	Viroqua	1.25
Kentucky	55.4	-0.5	Meade	99	9	Achilles	15	15	2.89	+0.55	Alpha	10.85	Paducah	2.14
Louisiana	65.7	-1.9	Williamsburg	90	2	Williamsburg	22	4	4.43	-0.31	Robeline	2.45	Covington	0.17
Maryland and Delaware	52.4	+0.6	Minden	91	30	Pikeville	32	4	1.11	+0.87	Bachmans Valley, Md.	7.02	Delaware City, Del.	2.29
Michigan	42.7	-0.4	Boetcheville, Md.	95	29	Deer Park, Md., Sunnyside, Md.	13	5	4.02	+1.24	Iron River	10.50	Cheboygan	0.10
Minnesota	43.3	-0.7	Carsonville	88	29	Humboldt	0	1	3.06	-0.36	Milaca	6.02	Poplarville	0.00
Mississippi	63.4	-1.4	New Ulm	80	22	Tower	0	4	2.82	-0.10	Hernando	5.98	St. Joseph	1.32
Missouri	55.8	+0.4	Natchez	92	9	Ripley	30	4	1.20	-0.08	Monroe City	7.94	Wibaux	T.
Montana	41.0	-1.8	Protem	91	2	Vichy	26	4	3.54	-0.69	Dillon	5.36	Wallace	0.30
Nebraska	49.4	+0.1	Glasgow	85	26	Adel	9	29	1.45	-0.21	Austin	1.91	5 stations	0.00
Nevada	45.2	-3.1	Fort Robinson	89	1, 8, 27	Fort Robinson	9	29	1.80	-0.32	Kingston, R. I.	6.91	Chelsea, Vt.	0.80
New England	44.8	+1.5	Bartley	89	27	Monitor Mill	1	1	0.47	+0.55	Hightstown	7.03	Cape May City	2.40
New Jersey	50.9	+1.5	Riverville	101	24	Fort Fairfield, Me.	1	5	2.69	-0.13	Winsors	1.88	5 stations	0.00
New Mexico	51.5	-1.8	3 stations	87	29, 30	Charlotteburg, Layton	18	6	3.97	-0.03	Primrose	5.66	Carvers Falls	0.78
New York	44.5	+0.6	Beverly, Paterson	92	30	Luna, Winsors	10	3	0.43	+0.99	Bryson City	8.61	Hatteras	1.74
North Carolina	57.3	-0.4	Carlsbad	94	1	Saranac Lake	6	5	2.47	-0.66	Berlin	3.65	2 stations	T.
North Dakota	42.5	+1.3	Gloversville	89	30	Liuville	15	5	4.81	-0.70	Strongsville	6.63	Green Hill	2.34
Ohio	49.9	+0.0	Washington	91	30	Berlin	8	7	1.23	+0.13	Jenkis, Okla.	3.52	Chickasha, Ind. T.	0.06
Oklahoma and Indian Territories	60.3	-1.3	Medora	83	25	Hillhouse	10	5	4.01	-0.98	Nehalem	10.50	2 stations	0.00
Oregon	46.7	-1.5	Portsmouth	88	29	Kenton, Okla.	20	14	1.32	-0.34	Greensboro	4.93	Elwood Junction	2.16
Pennsylvania	48.8	+0.9	Guthrie, Okla.	98	1	Bend, Joseph	8	10, 11	2.22	-1.00	La Isolina	13.75	Guayama	0.55
Porto Rico	79.7	+0.1	Grants Pass	84	24	Saegerstown	12	5	3.53	-0.66	Liberty	5.55	Beaufort	0.85
South Carolina	60.4	-1.7	Philadelphia	90	30	Barros	51	8	5.03	-0.70	Spearfish	5.56	Highmore	0.70
South Dakota	46.9	-0.0	Caguas	99	19	Clemson College	26	4	2.95	+0.13	Jonesboro	8.64	Covington	1.90
Tennessee	57.1	-0.9	3 stations	88	29, 30	Ramsey	9	30	1.69	-1.90	Houston	3.85	3 stations	0.00
Texas	66.7	-1.8	Hotch City	87	26	Silver Lake	20	5	4.61	-0.04	Kanab	2.79	Loa	0.00
Utah	46.0	-1.3	Waynesboro	89	12	Amarillo	26	30	1.03	+1.03	Bigstone Gap	7.43	Lynchburg	2.53
Virginia	54.3	0.0	Tra	97	2	Snowville	4	11	1.01	-0.68	Clearwater	9.30	Pasco	0.00
Washington	46.1	-2.2	Fort Ringgold	97	2, 12, 19	Loa	4	12	4.26	-0.89	Logan	7.30	Upper Tract	2.29
West Virginia	51.3	-0.3	Blue Creek	95	23	Hot Springs	12	4	2.26	+0.35	La Crosse	4.81	Hayward	1.49
Wisconsin	45.2	+0.3	Lincoln	92	30	Wilbur	16	12	1.94	-0.52	Red Bank	4.02	Pine Bluff	0.47
Wyoming	39.9	-1.3	Pomeroy	83	24	Travellers Repose	8	5	4.47					
			Zindel	83	25	Hayward	8	3	3.15					
			Magnolia	91	30	Embar	0	6	1.10					
			Beloit	80	2									
			Basin	83	17									

to damage oats, and rust developed on wheat. Fruit prospects remained unimpaired. Tobacco was about all transplanted, and grew fairly well. Corn planting made rapid progress and cultivation was begun, but stands were injured by insects. Cotton planting progressed rapidly, but seed came up poorly, necessitating much replanting. The season, as a whole, was somewhat backward.—*J. W. Bauer.*

**South Dakota.**—Although interrupted somewhat by rain or snow, plowing and the seeding of spring wheat, oats, barley, and spelt progressed favorably, and the grain germinated evenly, though slowly, until the 27th. Grass started well, but grew slowly. On the 29th and 30th temperatures below freezing damaged growing grains, resulting in some permanent injury to some early oats and barley, but practically none to wheat. Some wheat and considerable oats and barley were yet to be sown at the close of the month.—*S. W. Green.*

**Tennessee.**—Farm work progressed well during the first twelve days of the month and vegetation advanced rapidly; the second half of the month was wet and cold, excepting a few days, and at its close seasonal work was behind hand and crops generally were backward. Frosts on the 23d and 24th injured Irish potatoes, tomatoes, and tender vegetation. Wheat showed the effect of unfavorable weather, and some had begun to head very low. Some tobacco was set out.—*H. C. Bale.*

**Texas.**—The month was unusually cool. Heavy frosts occurred in the northern portion on the morning of the 30th, and cotton on lowlands was generally killed, and corn cut to the ground. Drought generally prevailed, but this was broken in the southern portion by good showers on the 29th. By the 15th the ground had become too dry and hard to be properly worked, and cotton planting and germination were thereby delayed. Early planted cotton made poor stands, and much replanting was necessary. Corn planting was practically completed by the 15th, but

poor stands were secured, and much had to be replanted. Cultivation of the early planted began during the middle decade. The growth of both cotton and corn was greatly retarded by the cool weather. Wheat, rye, and oats were considerably damaged by the drought.—*L. H. Murdoch.*

**Utah.**—Abnormally cold weather, with excessive cloudiness prevailed during April. The precipitation was slightly below the normal. Heavy frosts were frequent, and caused serious damage to apricots and sugar beets in localities. The seeding of wheat and oats was considerably delayed by cold weather. Early sown wheat was coming up well at the close of the month, but the late sown needed warmth for proper germination. Fall wheat was generally poor, and much alfalfa was found to be winter killed.—*L. Lodholz.*

**Virginia.**—The weather conditions throughout April were generally unfavorable for crop growth and for fieldwork, being rainy and with occasional cool spells and frosts. Small grain crops, which had entered the month in excellent condition, deteriorated considerably, becoming yellow and showing signs of rust in many localities. Seeding of spring oats and corn planting as well as preparation of corn land were much retarded. A severe freeze early in the month did great damage to early fruit bloom, especially to peaches and pears.—*Edward A. Evans.*

**Washington.**—Unseasonably cool, with frequent frosts until third decade, when there was a change to warm weather. Winter wheat and barley grew little before the 21st, after which warm rains followed by fine weather gave grain a considerable start. Fruit trees did not come into bloom until the last week. The lateness in blooming lessens the danger from frost, and is therefore favorable. The ground was too cold for planting until the last week. Wheat sowing was not finished at the end of the month. The season was fully three weeks later than usual.—*G. N. Salisbury.*

**West Virginia.**—Vegetation received a severe set back by the freeze of the 5th. Nearly all cherries, peaches, plums, and apples were killed. Even wheat, which was in the best condition in years, was slightly injured, and oats and clover were cut down in some cases. The weather continued unfavorable for growth during the rest of the month, and, at its close, but little improvement could be noted. Farm work was very backward, and plowing had been delayed by the wet condition of the ground. There was a prospect of some apples from late bloom.—*E. C. Vose.*

**Wisconsin.**—Although the average temperature for April was about normal, vegetation made but little progress, owing to the cloudy, wet weather and cold nights. Freezing temperatures were frequent throughout the month in the central and northern sections, and heavy frosts in

the southern. The rains were frequent, copious, and well distributed, but not excessive. Seeding was much delayed by the wet weather, and was not entirely completed by the end of the month. Little progress was made in preparing for corn and potatoes. Winter wheat, rye, and grass made fairly good progress.—*W. M. Wilson.*

**Wyoming.**—Cool weather prevented range grass from getting a good start before the close of the month. Plowing and seeding made good progress over the earlier sections, but over some of the later sections practically no spring work was done before the close of the month. The storm from the 27th to 29th, which was accompanied by cold weather, was severe on weak cattle and newly shorn sheep, and some losses were reported.—*W. S. Palmer.*

## SPECIAL CONTRIBUTIONS.

## HAWAIIAN CLIMATOLOGICAL DATA.

By CURTIS J. LYONS, Territorial Meteorologist.

## OBSERVATIONS AT HONOLULU.

The station is at 21° 18' N., 157° 50' W. It is the Hawaiian Weather Bureau station Punahou. (See fig. 2, No. 1, in the MONTHLY WEATHER REVIEW for July, 1902, page 365.) Hawaiian standard time is 10<sup>h</sup> 30<sup>m</sup> slow of Greenwich time. Honolulu local mean time is 10<sup>h</sup> 31<sup>m</sup> slow of Greenwich.

The pressure is corrected for temperature and reduced to sea level, and the gravity correction, -0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet and the barometer 50 feet above sea level.

## Meteorological Observations at Honolulu, April, 1903.

Date.	Pressure at sea level.		Temperature.	During twenty-four hours preceding 1 p. m. Greenwich time, or 1:30 a. m. Honolulu time.							Total rainfall at 9 a. m., local time.		
				Temperature.		Means.		Wind.		Average cloudiness.		Sea-level pressures.	
	Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.	Maximum.			Minimum.	
1.....	30.05	67	60	72	61	57.3	71	ne.	3	7	30.17	30.04	0.08
2.....	30.05	66	62.5	74	64	56.7	66	ne.	4-2	4	30.11	30.02	0.22
3.....	29.99	62	61	76	62	61.0	74	ne.	3	4	30.08	29.99	0.01
4.....	29.95	70	65	79	61	62.3	77	se-ne.	3	4	30.04	29.94	0.01
5.....	29.98	70	67	78	67	62.5	71	ne.	4	3	30.03	29.95	0.42
6.....	30.02	72	67	76	66	67.0	84	ne.	1	10-8	30.06	29.95	0.43
7.....	30.01	71	66	77	69	63.5	72	ne.	2-4	9	30.08	30.01	0.01
8.....	30.01	70	66	77	70	63.0	70	ne.	3	10-4	30.08	29.99	0.03
9.....	29.98	68	64	76	68	61.3	71	ne.	4	4	30.07	29.96	0.05
10.....	29.99	67	62.5	74	66	61.5	75	ne.	4-1	4	30.06	29.97	0.16
11.....	29.99	68	61	72	63	57.7	69	ne.	3-6	8-2	30.04	29.95	0.01
12.....	30.00	68	63.5	75	67	57.0	64	ne.	5-3	3	30.06	29.96	0.01
13.....	30.01	70	66.5	77	66	61.3	71	ne.	4	3-6	30.06	29.97	0.22
14.....	30.03	71	66.5	73	67	64.7	82	ne.	5	8	30.11	30.01	0.20
15.....	30.09	70	63.5	76	68	63.0	74	ne.	5-6	7-10	30.14	30.02	0.10
16.....	30.09	68	62.5	74	68	61.0	72	ne.	5-4	8	30.15	30.06	0.02
17.....	30.04	69	63	75	68	57.0	64	ne.	4	1	30.11	30.03	0.01
18.....	30.04	71	66	77	67	59.7	67	ne.	3-4	5	30.08	29.99	0.05
19.....	29.97	68	63.5	77	68	63.0	74	ne.	4	7	30.08	29.97	0.03
20.....	29.94	71	64.5	77	66	60.7	70	ne.	3	6-2	30.02	29.93	0.10
21.....	29.94	67	66	78	67	60.7	66	ne.	3	5	29.98	29.90	0.01
22.....	29.95	69	65.5	79	66	63.3	76	ne.	3	4	30.01	29.92	0.01
23.....	29.94	70	65.5	79	69	62.7	72	ne.	3	5-1	30.01	29.92	0.00
24.....	29.92	70	65	78	68	63.0	72	ne.	3	2	30.00	29.88	0.00
25.....	29.92	68	66.8	80	69	63.5	71	ne.	3	1	29.96	29.90	0.00
26.....	29.94	71	68.5	81	67	67.7	80	se.	1-0	7-10	29.99	29.89	0.01
27.....	29.94	74	68.5	81	70	67.5	80	sw.	0-1	10-0	30.01	29.93	0.00
28.....	30.00	71	65.5	79	69	64.7	70	nne.	0-4	7-3	30.04	29.95	0.00
29.....	30.04	69	65	77	70	62.5	73	ne.	4-5	3	30.09	30.01	0.07
30.....	30.01	67	66	77	68	63.5	75	ne.	4-3	4	30.09	30.00	0.08
31.....													
Sums.....													2.35
Means.....	29.994	69.1	64.8	77.0	67.0	62.3	72.8		3.2	5.1	30.000	29.967	
Departure.....	-0.027										0.0		-0.55

Mean temperature for April, 1903, (6 + 2 + 9) ÷ 3 = 71.9°; normal is 72.6°. Mean pressure for April, 1903, (9 + 3) ÷ 2 = 30.005; normal is 30.032.

\* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4.31 p. m., Greenwich time. ‡ These values are the means of (6 + 9 + 2 + 9) ÷ 4. § Beaufort scale.

Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

## GENERAL SUMMARY FOR APRIL, 1903.

**Honolulu.**—Temperature mean for the month, 71.9°; normal, 72.6°; average daily maximum, 77.0°; average daily minimum, 67.0°; mean daily range, 10.0°; greatest daily range, 18°; least daily range, 6°; highest temperature, 81°; lowest, 61°.

Barometer average, 30.005; normal, 30.032; highest, 30.15,

on the 15th; lowest, 29.88, on the 23d; greatest 24-hour change, that is, from any given hour on one day to the same hour on the next, 0.06; lows passed this point on the 4th, 10th, and 23d; highs on the 1st, 15th, and 20th.

Relative humidity average, 72.8 per cent; normal, 71.5 per cent; mean dew-point, 62.3°; normal, 63.5°; mean absolute moisture, 6.22 grains per cubic foot; normal, 6.42 grains; dew, 3 mornings.

Rainfall, 2.35 inches; normal, 2.90; rain record days, 25; normal, 17; greatest rainfall in one day, 0.43, on the 6th; total at Luakaha, 17.73; normal, 11.06; at Kapiolani Park, 1.14; normal, 1.19.

## Rainfall data for April, 1903.

Stations.		Elevation.	Amount.	Stations.		Elevation.	Amount.
HAWAII.				OAHU.			
HILO, e. and ne.		Feet.	Inches.			Feet.	Inches.
Waiakea		50	17.69	Punahou (W. B.), sw.		47	2.35
Hilo (town)		100	23.17	Kulaokahu (Castle), sw.		50	1.69
Kaunama		1,250	25.21	Makiki Reservoir		120	2.80
Pepeekeo		100	11.86	U. S. Naval Station, sw		6	1.53
Hakalau		200	18.45	Kapiolani Park, sw.		10	1.14
Honohina		300	23.15	College Hills		175	3.17
Puuhua		1,050	48.85	Manoa (Woodlawn Dairy), c.		285	8.96
Laupahoehoe		500	38.48	Manoa (Rhodes Gardens)		360	12.87
Ookala		400	23.57	School street (Bishop), sw.			
HAMAKUA, ne.				Insane Asylum, sw.		30	2.98
Kukiaia		250	21.72	Kamehameha School		75	
Pauilo		300	13.32	Kalihi-Uka, sw.		485	12.73
Pauhau		300	8.87	Nuuanu (W. W. Hall), sw.		50	3.44
Honokaa (Mill)		425	10.20	Nuuanu (Wyllie street)		250	6.07
Honokaa (Meinicke)		1,100		Nuuanu (Elec. Station), sw.		405	6.73
Kukuihaele		700	13.18	Nuuanu (Luakaha), c.		850	17.73
KOHALA, n.				U. S. Experiment Station		350	4.02
Awini Ranch			19.68	Pacific Heights		700	6.08
Niuli		200	8.80	Lanika (Nahuia)		1,150	10.67
Kohala (Mission)		521	8.62	Tantalus Heights		1,360	9.95
Kohala (Sugar Co.)		270	8.43	Waimanalo, ne.		390	3.17
Hawi, Mill		700		Maunawili, ne.		300	8.26
Puakea Ranch		600	6.38	Kaneohe		100	7.66
Puuhue Ranch		1,847	2.97	Ahuimanu, ne.		350	10.28
Waimea		2,720	3.49	Kahuku, n.		25	1.92
KONA, w.				Waialua		37	
Holualoa		1,350	5.88	Wahiawa		900	4.08
Kealahou		1,580	5.82	Ewa Plantation, s.		60	1.12
Napooopo		25	2.87	U. S. Magnetic Station		45	0.95
Hoopulua		1,650		Waipahu		200	1.00
Hoopulua		2,500		Moanalua		15	3.24
KAU, se.				KAUAI.			
Kahuku Ranch		1,680		Lihue (Grove Farm), e.		200	5.23
Honuaopo		15	2.04	Lihue (Molokaa), e.		300	5.30
Naalehu		650	3.13	Lihue (Kukaua), e.		1,000	11.70
Hilea		310	2.50	Kealia, e.		15	3.01
Pahala		850	3.00	Kilauea, ne.		325	6.47
Moaula		1,700	2.90	Hanalei, n.		10	16.38
Volcano House		4,000	9.15	Waiohi		10	17.75
PUNA, e.				Haena		15	16.30
Olaa, Mountain View (Russel)		1,690	28.72	Waialua		32	
Olaa (Plantation)				Eleele		150	2.58
Kapoho		110	10.16	Wahiawa (Mountain)		3,000	29.30
Pahoa		600		McBryde (Residence)		850	9.21
MAUI.				Lawai (Gov. Road)		450	12.24
Lahaina		40		Lawai, w.		225	4.46
Waioape Ranch		700	1.89	Lawai, e.		800	12.33
Kaupo (Mokulau), s.		285	7.96	Koloa		100	4.21
Kipahulu, s		308	8.09	Delayed March reports.			
Hana				Hakalau			10.51
Nahiku, ne		800	42.29	Honohina			10.21
Nahiku		1,600		Kipahulu			4.95
Haiku, n.		700	9.62	Pahala			9.38
Kula (Erehwon), n.		4,500	0.33	Moaula			10.61
Kula (Waiahoa), n.		2,700	0.68	Hoopulua		2,500	4.15
Puomalei, n.		1,400	8.77	Puomalei			
Paia		180	4.06	Wyllie Street			
Haleakala Ranch		2,000	3.64				
Wailuku, ne.		250	3.12				

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.